CLAIMS

We claim:

1. An apparatus comprising:

a converter within an integrated circuit to convert a battery voltage from a battery to an output voltage to power the integrated circuit in a battery-operated mode of operation, when the battery is made available to the integrated circuit; and

a control unit to switch the converter to a battery-charge mode of operation to power the integrated circuit and to charge the battery, when external power is supplied.

2. The apparatus of claim 1, wherein the converter includes a switching transistor circuit to alternately switch transistors to regulate the output voltage in the battery-operated mode and in the battery-charge mode, but the switching transistor circuit is disabled in an external powered mode of operation, when external power is present and the battery is not to be charged.

3. The apparatus of claim 2, wherein the control unit to monitor presence of the external power and to place the converter into the battery-charge mode or external powered mode, when the external power is present.

4. The apparatus of claim 3, wherein when external power is present, the external power is used to generate a voltage source if the converter is in the external powered mode and the external power is used to generate a current source if the converter is in the battery-charge mode, the control unit to select between the external powered mode and battery-charge mode.

5. The apparatus of claim 4 further comprising an analog to digital converter to monitor the battery voltage and to transmit a signal to the control unit to indicate when the battery is to be charged.

6. The apparatus of claim 4, wherein the integrated circuit receives the external power from a Universal Serial Bus link.

7. A direct current – direct current (DC-DC) converter, which is also employed as a battery charger, comprising:

a switching transistor circuit to convert a battery voltage from a battery to an output voltage to power an integrated circuit in a battery-operated mode of operation

when the battery is made available to the integrated circuit at a first node, the switching transistor circuit including alternately switching transistors to regulate the output voltage at a second node in the battery-operated mode, the switching transistors also to regulate the output voltage at the second node and to provide charge current to charge the battery in a battery-charge mode of operation when external power from an external source is present;

a control unit to control operation of the converter in one of three modes, the battery-operated mode to convert the battery voltage to the output voltage when the external power is not present, the battery-charge mode to employ the external power to generate a current source to charge the battery and maintain the output voltage at the second node when external power is present, and an external powered mode of operation to employ the external power to generate a voltage source to source the output voltage at the second node when the external power is present; and

an enabling circuit to operate with the control unit to disable the switching transistors in the external powered mode and enable the switching transistors in the battery-operated and battery-charge modes.

8. The DC-DC converter of claim 7, wherein the enabling circuit controls signals to gates of the switching transistors to enable and disable the switching transistors.

9. The DC-DC converter of claim 8, wherein when the external power is present, the control unit to initiate the battery-charge mode of operation only if the battery needs charging.

10. The DC-DC converter of claim 9, wherein the enabling circuit to control enabling or disabling of the switching transistors under control of the control unit to toggle between the battery-charge and external powered modes, when the external power is present.

11. The DC-DC converter of claim 10, further comprising a switch controlled by the control unit select between the external powered and battery-charge modes in response to a state of charge of the battery.

12. The DC-DC converter of claim 11, further comprising an analog to digital converter to monitor the battery voltage and to transmit a digital signal to the control unit to indicate if the battery needs to be charged.

13. The DC-DC converter of claim 11, wherein the integrated circuit receives the external power from a Universal Serial Bus link.

14. An integrated circuit which has an audio system integrated therein, comprising:

an input interface to receive audio data input;

a digital signal processor to receive the audio input and generate processed audio data;

an output amplifier to output the processed audio data external to the integrated circuit; and

a direct current – direct current (DC-DC) converter, which is also employed as a battery charger, the DC-DC converter comprising:

(a) a switching transistor circuit to convert a battery voltage from a battery to an output voltage to power an integrated circuit in a battery-operated mode of operation when the battery is made available to the integrated circuit at a first node, the switching transistor circuit including alternately switching transistors to regulate the output voltage at a second node in the battery-operated mode, the switching transistors also to regulate the output voltage at the second node and to provide charge current to charge the battery in a battery-charge mode of operation when external power from an external source is present;

(b) a control unit to control operation of the converter in one of three modes, the battery-operated mode to convert the battery voltage to the output voltage when the external power is not present, the battery-charge mode to employ the external power to generate a current source to charge the battery and maintain the output voltage at the second node when external power is present, and an external powered mode of operation to employ the external power to generate a voltage source to source the output voltage at the second node when the external power is present; and

(c) an enabling circuit to operate with the control unit to disable the switching transistors in the external powered mode and enable the switching transistors in the battery-operated and battery-charge modes.

15. The integrated circuit of claim 14, wherein when the external power is present, the control unit to initiate the battery-charge mode of operation only if the battery needs charging.

16. The integrated circuit of claim 15, wherein the enabling circuit to control enabling or disabling of the switching transistors under control of the control unit to toggle between the battery-charge and external powered modes, when the external power is present.

17. The integrated circuit of claim 16, wherein the DC-DC converter further comprising an analog to digital converter to monitor the battery voltage and to transmit a digital signal to the control unit to indicate if the external battery needs to be charged.

18. The integrated circuit of claim 16, wherein the external power is received from a Universal Serial Bus link.

19. A method of employing a direct current – direct current (DC-DC) converter to charge a battery comprising:

monitoring to determine if external power from a data transfer link is present to power an integrated circuit;

providing a DC-DC conversion in a first mode of operation to convert a battery voltage to generate an output voltage to power the integrated circuit, if the external power is not present;

utilizing the external power to generate a voltage source to provide the output voltage to power the integrated circuit in a second mode of operation when external power from the data transfer link is present, the second mode of operation disabling circuitry for the DC-DC conversion; and

utilizing the external power to generate a current source to power the circuitry for the DC-DC conversion to power the integrated circuit in a third mode of operation and also utilizing the same circuitry for the DC-DC conversion to charge the battery.

20. The method of claim 19 further comprising monitoring the battery voltage to determine if the battery needs charging when the external power is present to power the integrated circuit.

21. The method of claim 20, wherein the external power is provided from a Universal Serial Bus link.

22. The method of claim 20, wherein the external power is provided from a Universal Serial Bus 2.0 link.